After the maximum stroke height of FIG. 5 is accomplished, the angular inertia from the aircraft propeller, is transmitted, through shaft 38, to cam 44, to connecting rod 52 and to piston 54. This will, as is shown in the transition from FIG. 5 to FIG. 6, cause downward motion of the rod and piston. As this occurs, air pressure within distal cylinder housing 56 will increase as will potential energy within spring 70. This process continues causing spring 70 to contact ball 14 at about 350 degrees. In the view of FIG. 7 which corresponds to a cam position of 355 degrees, a point of near maximum pressure within distal housing 56 is accomplished. The 360 degrees or zero degrees position is shown in the view of FIG. 8. At that point, as above described with reference to FIG. 3, the spring force of spring 70 will overcome the 151 grams of force applied by the compressed air input from canister 10 against the distal surface 56a of ball 14.

Summarizing this action, the power of the downstroke of the piston derives from the angular inertia of the propeller which, during a period of low cylinder pressure, is transmitted through the power shaft to the piston 54 and to the piston spring 70 during which potential energy is imparted to both said spring and to compressed air within distal cylinder housing 56. Conversely, power for the upward stroke of the piston derives from a combination of the mass and energy of the compressed air input and the release of potential energy within piston spring 70 as it pushes off of ball 14 at the beginning of the expansion process which is shown in FIG. 4. Therein, the one way check valve, as actuated by piston spring 70, keeps the supply of air from the air canister 10 closed for all but a brief interval during which the spring force of piston spring 70, less the spring force of one way check valve spring 22, overcomes the air pressure against surface 56a of ball 14 of the check valve. The spring force and spring rate of piston spring 70, as well as the narrow clearance of less than a millimeter between the outside diameter of the spring and the cylinder inlet 20, taken with the conical geometry 72 of housing inlet 62, all co-act to provide a reiterating high pressure air inlet of suitable duration, thereby initiating a process of engine expansion and compression respectively using the potential energy stored within the air canister 10 and spring 70.

FIG. 9 is a schematic view showing the location of the entire engine assembly, as above described, and air canister 10, relative to fuselage 76, main wing 78 and propeller 80 of a model airplane equipped with the present inventive pneumatic engine.

While there has been shown and described the preferred embodiment of the instant invention it is to be appreciated that the invention may be embodied otherwise than is herein specifically shown and described and that, within said embodiment, certain changes may be made in the form and arrangement of the parts without departing from the underlying ideas or principles of this invention, as claimed herein.

We claim:

1. A fluid input assembly for a pneumatic engine for toy vehicles, the assembly comprising:

(a) a rechargeable inflatable resilient compressed air canister having a normally open mouth thereof; and

(b) an intake manifold of said pneumatic engine, said manifold comprising an internal air inlet for complementally receiving said open mouth of said canister, said manifold further comprising means for enabling continuous flow of compressed air from said canister through said air inlet and to said pneumatic engine.

2. The assembly as recited in claim 1, said intake manifold further comprising:

(c) an external air inlet inclusive of a one-way check valve for permitting selectable external re-pressurization of said air canister without removal thereof from said internal air inlet.

3. The assembly as recited in claim 1, in which an interface of said intake manifold said mouth of said air canister and air canister defines means for complemental positive mechanical securement to thereby ensure secure fluid communication of said air inlet with air canister.

4. A fluid input assembly for a pneumatic engine for a toy vehicle, the assembly comprising:

(a) a rechargeable inflatable resilient compressed air canister having a normally-open mouth including thread means integrally formed upon an external surface of a mouth-defining neck of said mouth;

(b) a substantially circumferential retaining cap bracket including therein thread means proportioned for complemental securement about said thread means of said neck of said canister; and

(c) an engine-to-canister bracket comprising means for mechanical securement of said canister to exterior surfaces of said pneumatic engine,

whereby said canister is stabilized relative to said pneumatic engine.

5. The assembly as recited in claim 4, further comprising: retaining mean s positioned about said mouth of said canister.

6. The assembly as recited in claim 4, further comprising: an external air inlet for said air canister in continuous fluid communication with said input assembly by which selectable external re-pressurization of said canister may be accomplished.

7. A pneumatic engine for toy vehicles, comprising:

(a) a selectably inflatable compressed air canister;

(b) an intake manifold, comprising:

an engine air inlet, in fluid communication with said air canister, the inlet including means for providing compressed air to said canister through said manifold;

(c) a cylinder housing including:

(i) distal and proximal regions thereof,

(ii) an inlet in fluid communication with said engine air inlet, and

(iii) at said proximal region, a plurality of air exhaust apertures;

(d) a one-way check valve including a proximal element, reciprocally situated at least partially within said inlet of said cylinder housing, said check valve residing in a normally closed position relative to said inlet;

(e) a piston slidably mounted along a longitudinal axis of said housing in a substantially fluid-tight relationship relative to internal circumferential walls of said distal region of said cylindrical housing, said piston including an axial member projecting distally toward said cylinder housing inlet and proportioned in diameter for insertion thereinto, said piston having a substantially concave proximal surface thereof;

(f) a piston spring mounted about said axial member of said piston and having a length greater than said axial member and, thereby, at a distal end thereof, having a length sufficient to effect selectable contact with a proximally directed element of said check valve during intervals of high pressure between said piston and said cylinder housing;

(g) a connecting rod having a distal end proportioned for complemental non-rigid mechanical interface with said proximal surface of said piston;

(h) an eccentric rotationally mounted to an engine power delivery shaft, said eccentric rotatable secured to a proximal end of said connecting rod, in which rotation of said eccentric by said rod will transmit angular momentum and force to said system power shaft,

whereby reciprocation of said connecting rod by said eccentric will increase pressure between a distal side of said piston and enclosed internal portions of said cylinder housing and will compress said piston spring against said proximal element of said check valve, thereby imparting potential energy to both said spring and compressed air within said cylinder and, further whereby, at maximum of distal reciprocation, said proximal element of said check valve will urge open relative to said inlet of said cylindrical housing, thereby effecting a brief high pressure input of compressed air from said canister, through said intake manifold and into said distal region of said cylindrical housing, said high pressure air input thereby initiating expansion of said piston spring and movement of said piston toward said proximal region of said cylinder housing, the same causing reiterative cycles of reciprocation of said piston, connecting rod, cam, and engine power shaft.

8. The engine as recited in claim 7, in which said intake manifold and air canister comprise means for complemental positive mechanical securement therebetween which ensures said fluid communication of said air inlet with said air canister.

9. The engine as recited in claim 2, in which securement means include a radial cap of said intake manifold having thread means for securement to said canister and an elastomeric seal seated between said intake manifold and said canister.

10. The engine as recited in claim 7, in which said piston comprises:

a piston seal, including a circumferential skirt proportioned in radius to inner walls of said housing, said seal integrally dependent from a proximal surface of said piston.

* * * * *

11. A pneumatic engine, comprising:

(a) a rechargeable canister having an opening therein;

(b) an engine cylinder; and

(c) a chamber rigidly coupled to said canister, said chamber having an aperture therethrough and an air inlet in fluid communication with said opening in said canister, said chamber also in fluid communication with said engine cylinder.

12. A pneumatic engine according to claim 11, wherein

said chamber is rigidly coupled to said engine cylinder.

13. A pneumatic engine according to claim 11, wherein

said engine cylinder has an air inlet, said air inlet adapted to allow air to pass from said chamber to said engine cylinder.

14. A pneumatic engine according to claim 13, wherein

said engine cylinder air inlet has a one-way check valve.

15. A pneumatic engine according to claim 11, wherein

said aperture is adapted to allow high pressure air to be pumped through said chamber and into said canister.

16. A pneumatic engine, comprising:

a rechargeable canister having a opening therein;

an engine cylinder; and

a chamber rigidly coupled to said engine cylinder, said chamber having an aperture therethrough and an air inlet in fluid communication with said opening in said canister, said chamber also in fluid communication with said engine cylinder.

17. A pneumatic engine according to claim 16, wherein

said chamber is rigidly coupled to said canister.

18. A pneumatic engine according to claim 16, wherein

said engine cylinder has an air inlet, said air inlet adapted to allow air to pass from said chamber to said engine cylinder.

19. A pneumatic engine according to claim 18, wherein

said engine cylinder air inlet has a one-way check valve.

20. A pneumatic engine according to claim 16, wherein

said aperture is adapted to allow high pressure air to be pumped through said chamber and into said canister.

21. A pneumatic engine, comprising:

a rechargeable canister having an opening therein;

an engine cylinder;

a valve for recharging said canister: and

a chamber rigidly coupled to said canister, said chamber having a first channel and a second channel, said first channel coupled to said opening in said canister and adapted to allow fluid to pass therethrough, and said second channel coipled to said valve and adapted to allow fluid to pass therethrough.

22. A pneumatic engine according to claim 21, wherein

said second channel is coupled to said engine cylinder and said first channel is coupled to said second channel.

23. A pneumatic engine according to claim 21, wherein

said first and second channels allow fluid to pass from said valve to said canister.

24. A pneumatic engine according to claim 21, wherein

said first and second channels allow fluid to pass from said canister to said engine cylinder.

25. A pneumatic engine according to claim 21, wherein said chamber is rigidly coupled to said engine cylinder.

26. A pneumatic engine according to claim 21, wherein said fluid is high pressure air.